I claim:

1. A method of manufacturing a multilayer, thin film interference filter comprising the steps of:

depositing a plurality of thin film layers on a substrate;

monitoring the formation of at least some of the thin film layers during the deposition process, said monitoring step including the steps of;

directing a narrow-band radiation probe beam to reflect off the layers on the substrate;

monitoring the change in polarization state of the probe beam induced by the interaction with the layers and generating output signals in response thereto; and

controlling the deposition process based on the monitored output signals.

2. A method as recited in claim 1 wherein the step of controlling the deposition process includes halting the process when the monitored output signals fall outside a predetermined range.

3. A method as recited in claim 1 wherein the step of controlling the deposition process includes varying the deposition process parameters.

4. A method as recited in claim 1 further including the step of evaluating the characteristics of the layers based on the monitored change in polarization state of the probe beam and using the results of the evaluation to control the deposition process.

5. A method as recited in claim 1 wherein step of monitoring the change in polarization state of the beam includes passing the beam through a rotating polarizer.

6. A method as recited in claim 1 wherein step of monitoring the change in polarization state of the beam includes passing the beam through a compensator rotated at an effective angular frequency of ω.

7. A method as recited in claim 6 wherein the output signals include 2ω and 4ω components and wherein said 2ω and 4ω components are used to control the deposition process.

8. A method as recited in claim 1 wherein the probe beam is generated by a laser.

9. A method as recited in claim 8 wherein the laser is a gas discharge laser.

10. A method as recited in claim 8 wherein the laser is a diode laser.

11. A method as recited in claim 1 wherein the probe beam is generated by a filtered broad band light source.

12. An apparatus for fabricating an interference filter defined by multiple thin film layers deposited on a substrate comprising:

means for depositing thin film layers on the substrate;

a light source for generating a narrow band probe beam which is directed to reflect off the layers on the substrate;

a optical system for monitoring the change in polarization state of the probe beam induced by interaction with the sample and generating output signals in response thereto; and

a control system responsive to the output signals for modifying the operation of the deposition means.

13. An apparatus as recited in claim 12 wherein the control system functions to halt the deposition process when the monitored output signals fall outside a predetermined range.

14. An apparatus as recited in claim 12 wherein the control system functions to vary the deposition process parameters in response to the output signals.

15. An apparatus as recited in claim 12 wherein the control system functions to evaluate the characteristics of the layers based on the monitored change in polarization state of the probe beam and uses the results of the evaluation to control the deposition process.

16. An apparatus as recited in claim 12 wherein the optical system includes a rotating polarizer.

17. An apparatus as recited in claim 12 wherein the optical system includes a compensator rotated at an effective angular frequency of ω.

18. An apparatus as recited in claim 17 wherein the output signals include 2ω and 4ω components and wherein said 2ω and 4ω components are used to control the deposition process.

19. An apparatus as recited in claim 12 wherein the light source is a laser.

20. An apparatus as recited in claim 19 wherein the laser is a gas discharge laser.

21. A method of manufacturing a multilayer, thin film interference filter comprising the steps of:

depositing a plurality of thin film layers on a substrate;

monitoring the formation of at least some of the thin film layers during the deposition process, said monitoring step including the steps of;

generating a probe beam from a broad band light source;

directing the probe beam to reflect off the layers on the substrate;

monitoring the change in polarization state of at least a narrow wavelength band within the probe beam, said change in polarization state being induced by the interaction with the layers and generating output signals in response thereto; and

controlling the deposition process based on the monitored output signals.

22. A method as recited in claim 21 wherein broad band light in the probe beam is filtered either before or after reflecting off the sample and prior to the monitoring step to permit measurement of a narrow wavelength band.

23. A method as recited in claim 22 wherein the filtering is performed by one of a monochrometer and a spectrometer.

24. A method as recited in claim 22 wherein multiple narrow wavelength bands are measured simultaneously.

25. A method as recited in claim 22 wherein the step of controlling the deposition process includes halting the process when the monitored output signals fall outside a predetermined range.

26. A method as recited in claim 22 wherein the step of controlling the deposition process includes varying the deposition process parameters.

27. A method as recited in claim 22 further including the step of evaluating the characteristics of the layers based on the monitored change in polarization state of the probe beam and using the results of the evaluation to control the deposition process.

28. A method as recited in claim 22 wherein step of monitoring the change in polarization state of the beam includes passing the beam through a rotating polarizer.

29. A method as recited in claim 22 wherein step of monitoring the change in polarization state of the beam includes passing the beam through a compensator rotated at an effective angular frequency of ω.

30. A method as recited in claim 29 wherein the output signals include 2ω and 4ω components and wherein said 2ω and 4ω components are used to control the deposition process.

31. A method as recited in claim 1 wherein the probe beam is generated by one of a tungsten or a deuterium bulb.

32. An apparatus for fabricating an interference filter defined by multiple thin film layers deposited on a substrate comprising:

means for depositing thin film layers on the substrate;

light source means for generating a probe beam of radiation which is directed to reflect off the layers on the substrate;

a optical system for monitoring the change in polarization state of the probe beam induced by interaction with the sample and generating output signals in response thereto; and

a control system responsive to the output signals for modifying the operation of the deposition means.

33. An apparatus as recited in claim 32 wherein the light source means is a laser for generating a narrow band output.

34. An apparatus as recited in claim 32 wherein the light source means is a broad band light source which is filtered to permit the optical system to monitor the changes in polarization state at a narrow wavelength region.

35. An apparatus as recited in claim 34 wherein the filtering is performed by one of a monochrometer and a spectrometer.

36. An apparatus as recited in claim 34 wherein the filtering is performed with a spectrometer and multiple narrow wavelength bands are measured simultaneously.

37. An apparatus as recited in claim 32 wherein the control system functions to halt the deposition process when the monitored output signals fall outside a predetermined range.

38. An apparatus as recited in claim 32 wherein the control system functions to vary the deposition process parameters in response to the output signals.

39. An apparatus as recited in claim 32 wherein the control system functions to evaluate the characteristics of the layers based on the monitored change in polarization state of the probe beam and uses the results of the evaluation to control the deposition process.

40. An apparatus as recited in claim 32 wherein the optical system includes a rotating polarizer.

41. An apparatus as recited in claim 32 wherein the optical system includes a compensator rotated at an effective angular frequency of ω.

42. An apparatus as recited in claim 41 wherein the output signals include 2ω and 4ω components and wherein said 2ω and 4ω components are used to control the deposition process.